

Rathbun Lake Water Quality Summary

2005-2014

The **US Army Corps of Engineers** (USACE) Water Quality Program collects monthly water samples at Rathbun Lake* April through September while Rathbun Land Water Alliance and Iowa Dept. of Natural Resources (IDNR) and USACE work together to sample inflow streams at 14 watershed sites. Inflow monitoring results can be found at RLWA.ORG. These figures present data collected between 2005-2014 from lake sites RA3, RA7, RA8, RA25, and the outflow RA28 at the dam. Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. USACE use this data to describe conditions and changes from the inflows, lake, and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

*Note: The term "lake" is substituted for technically correct "reservoir" throughout this document for consistency.

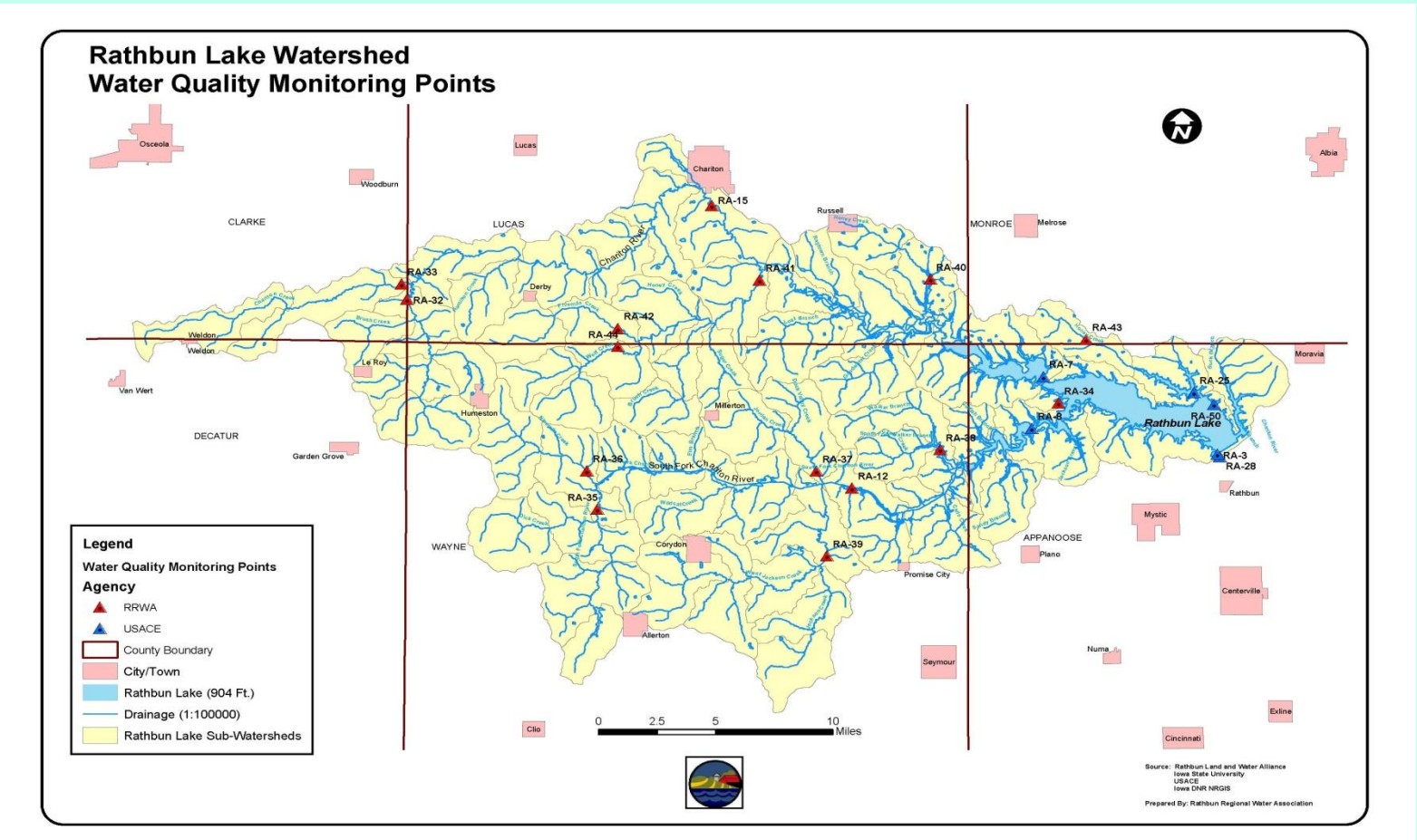
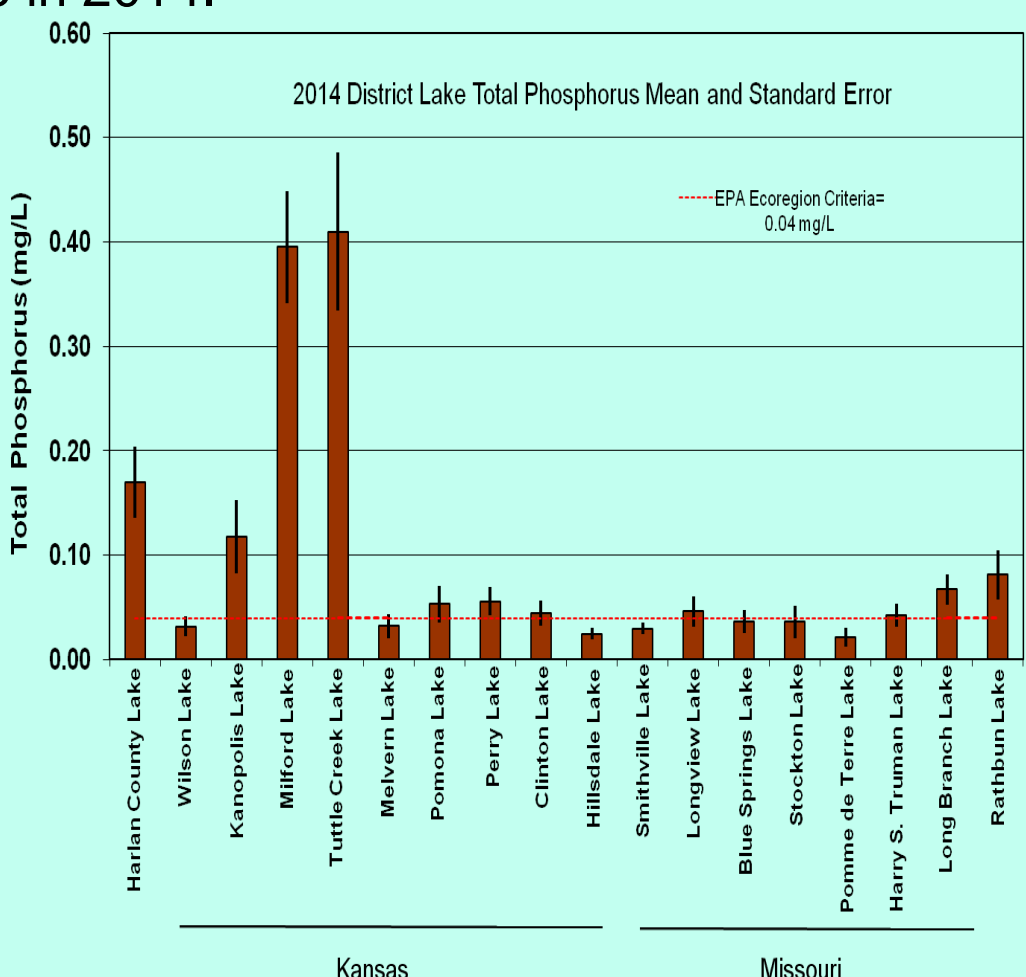
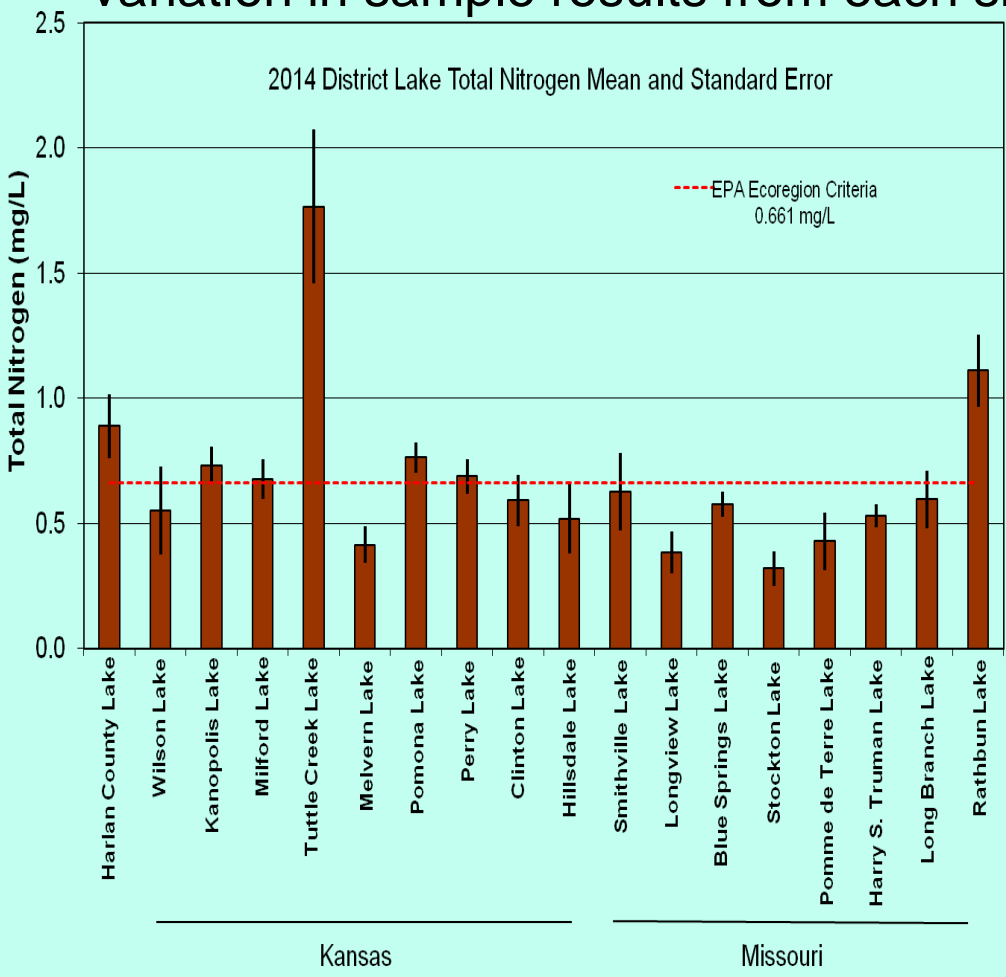
Rathbun Lake

Built on the Chariton River and filled to multipurpose pool in 1970

- **Watershed** = 549 sq miles (351,360 Acres)
- **Capacity:**
 - Flood Control: 349,173 Acre Feet (AF)/ 22,452 surface acres (SA)
 - Multipurpose: 221,360 AF / 10,329 SA/ 155 miles of shoreline
- **Operating project purposes:** Flood damage reduction, water supply, water quality, recreation, navigation, and fish and wildlife management.
- **Avg. annual inflow** (2005-2014)= 405,508 AF; **2014 inflow** =415,648 AF
- **Water Quality** at Rathbun Lake in 2014 was beneficial to operating purposes listed above and measured parameters did not exceed Iowa State WQ Standards for designated uses. Water quality at Rathbun Lake improves as nutrients, herbicides and sediments are removed by settling, dilution, and biological processes as water moves from inflow streams to the dam.

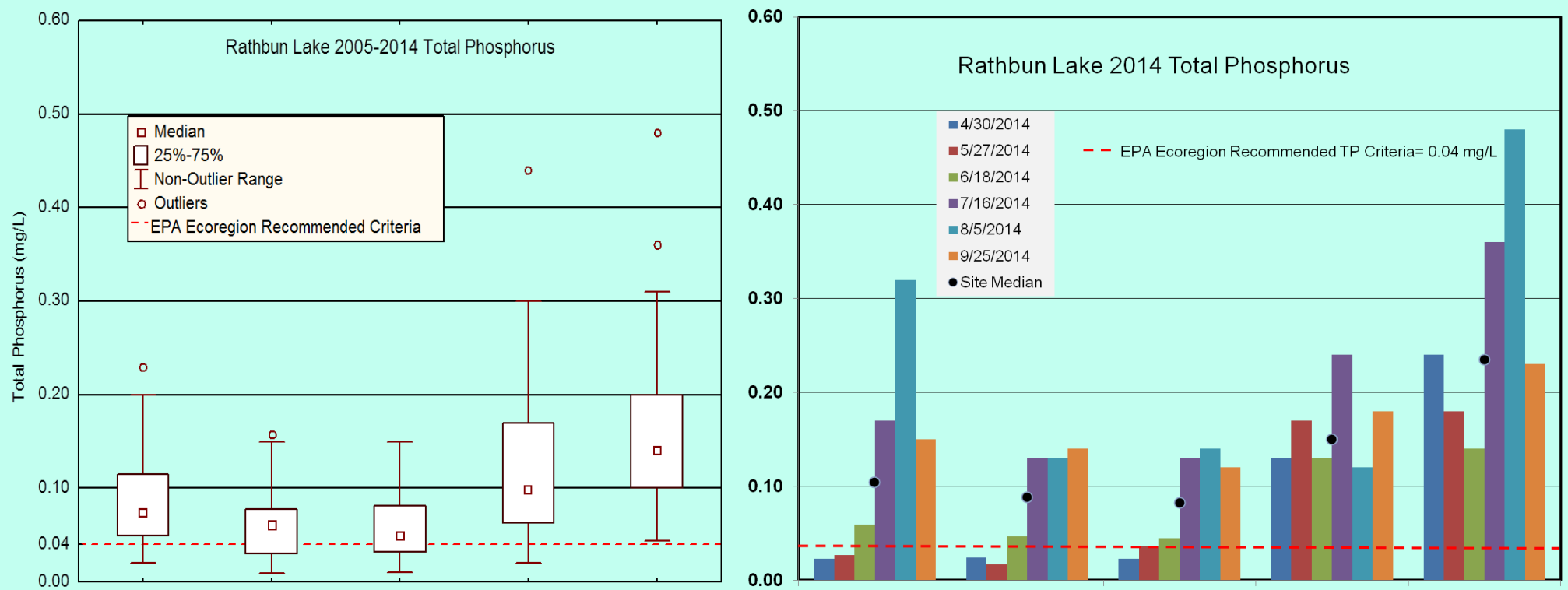
Nutrient enrichment

Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging or eutrophication process in lakes. This can alter plant and aquatic life in lakes and water bodies, cause algal blooms, create low dissolved oxygen that affect fish survival, and lead to taste and odor issues in drinking water. Rathbun Lake remains on the 2012 Iowa 303(d) list of impaired waters due excessive algae and turbidity. EPA and IDNR are working with water quality partners, landowners and Rathbun Land Water Alliance to focus watershed conservation efforts on priority or target areas in the watershed to reduce nutrient and sediment runoff. This approach is designed to improve water quality and reduce designated impairments at Rathbun Lake. In 2014, inflows were slightly above the 10-year average. Consequently, measured nutrients and TSS were 37%-47% less than 10 year averages at Rathbun Lake and inflow sites. Rathbun Lake average TP and TN measured at the dam (RA3) were nearly twice the EPA ecoregion recommended criteria. Standard error bars in the graphs below illustrate the variation in sample results from each site in 2014.



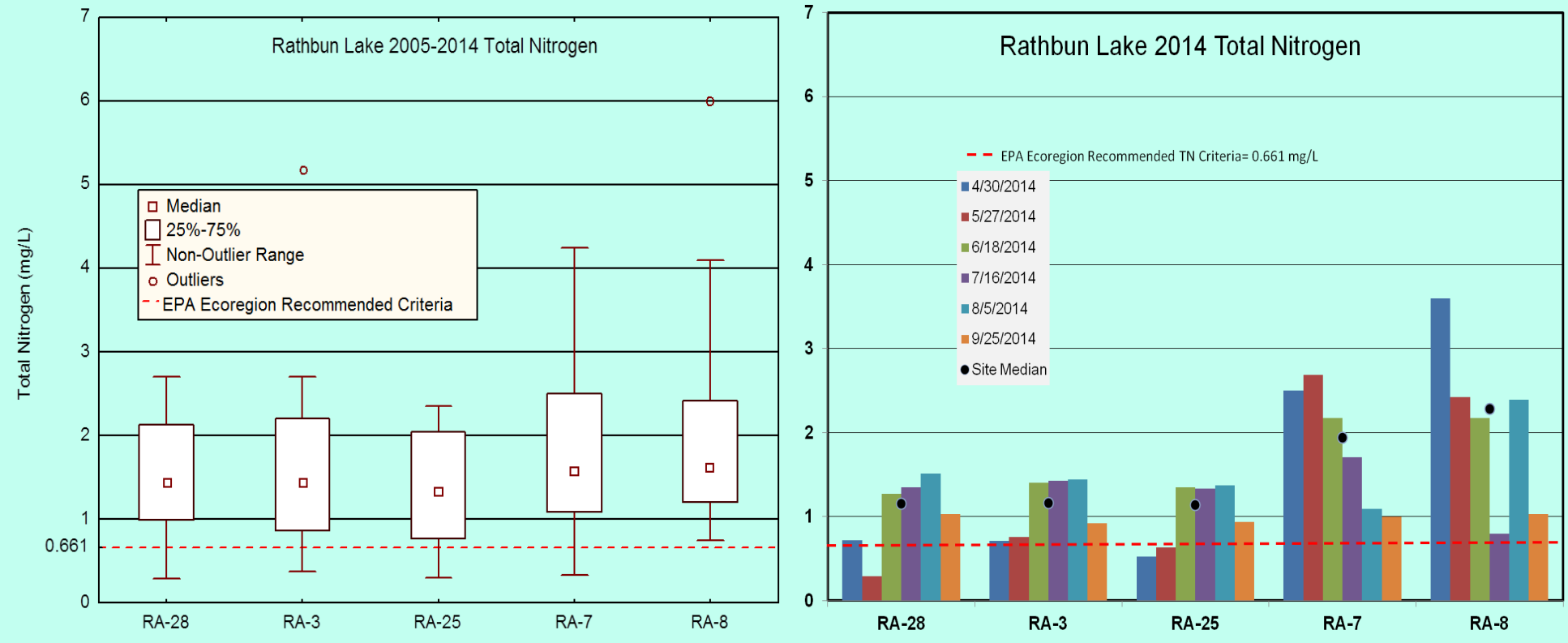
Total Phosphorus

Total phosphorus (TP) from all sample locations at Rathbun Lake exceeded EPA nutrient criteria in excess of 75% of samples taken 2005-2014. External inputs of phosphorus from the watershed are typically the primary source for high TP at Rathbun Lake. Above average inflows resulted increased TP in 2014. Median TP was higher than 75% of samples collected from 2005-2014 from all sites except RA-7. Median TP at all Rathbun Lake sites are in the range of high biological productivity leading to high algae populations and rapid fish growth and upper lake sites are in the hypereutrophic range in 2014. Blue green algae is present in Rathbun, but conditions (i.e. nitrogen:phosphorus ratio, turbidity, water residence time) tend to favor beneficial green algae species over toxic blue green species.



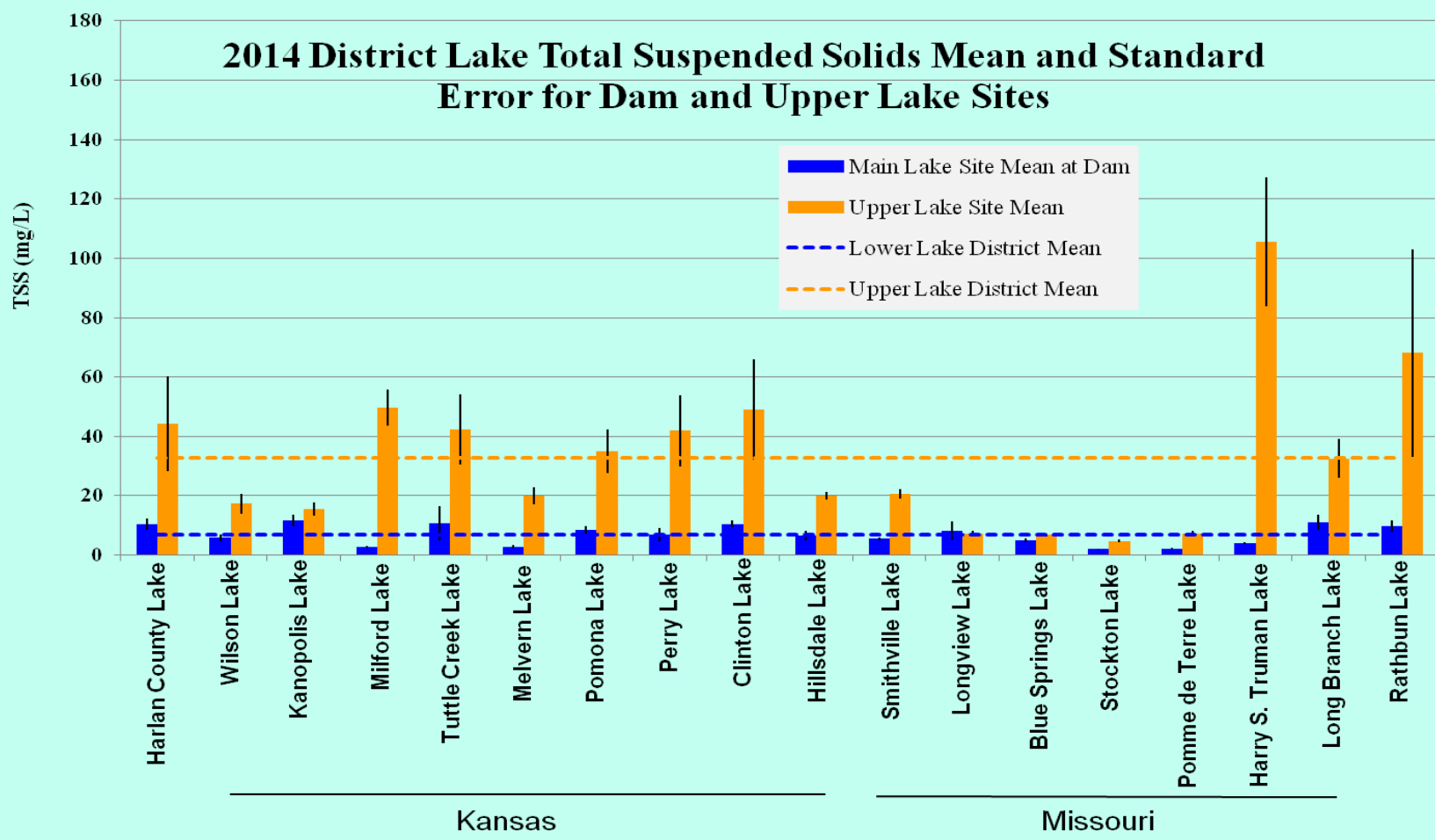
Total Nitrogen

Total nitrogen (TN) calculated from Rathbun Lake are typically near the highest of all District Lakes with seasonal medians nearly twice EPA Ecoregion criteria (0.661 mg/L). Higher than average inflows contributed to increased TN values in 2014. The highest concentrations of TN are typically found at RA-8 (South Fork Chariton Arm). Nitrogen concentrations are highly variable between sites and years mostly related to inflow discharge and upstream land use.



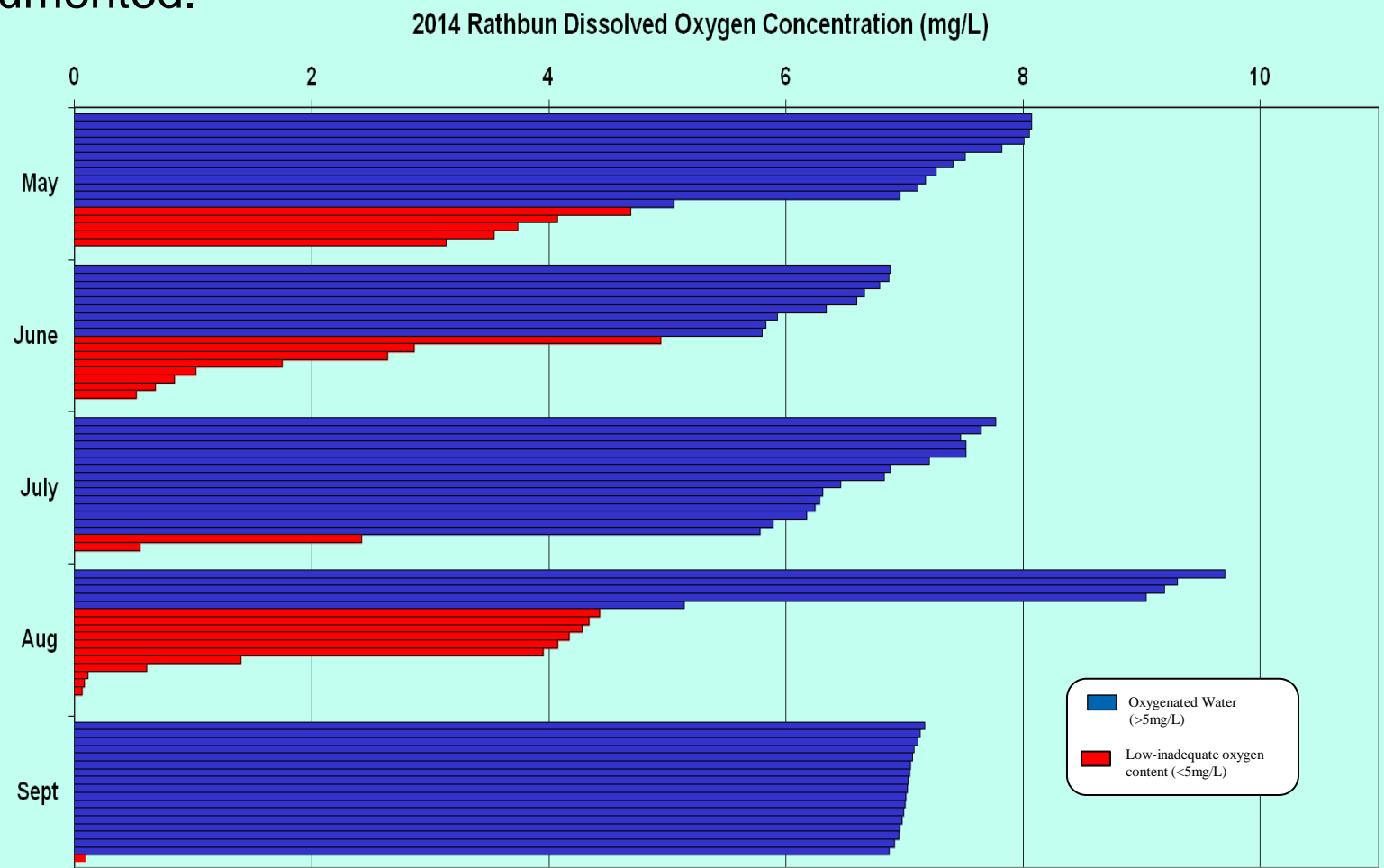
Total Suspended Solids

Total suspended solids (TSS) or filterable solids in streams and lakes is a function of watershed characteristics including soil composition, land use, weather patterns, and characteristics of inflowing streams. TSS is an indicator of erosion in watersheds, sedimentation or filling rates of downstream reservoirs, and is also closely linked to nutrient and contaminant transport through river systems. In 2014, Rathbun Lake TSS values were higher than average for District lakes at upper lake sites with 85% of TSS settled out as water moved from the upper lake to the dam. Rathbun upper lake sites were also the most variable by month.



Dissolved Oxygen

Dissolved oxygen (D.O.) is an important factor in aquatic species location, growth, and ultimately survival in lakes. Rathbun Lake stratifies during summer months. Adequate (>5 mg/L) dissolved oxygen was measured in the top 5 meters of water in 2014. Increased oxygen consumption from algae decomposition or biological oxygen demand contributes to lower dissolved oxygen after algae blooms, but oxygen related fish kills have not been documented.



Water Quality Concerns:

- Sediment inputs
- Algae blooms
- Nutrients
- Pesticides



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